

Switching Operations Fatality Analysis



Findings and Recommendations of the SOFA Working Group

August 2004 Update

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Dedication

The SOFA Working Group (SWG) wishes to dedicate this study to the memory of those whose lives were lost in switching operations. The SWG expresses its condolences to the families of those individuals. The families can take comfort in the assurance that the study of each event is handled with respect and dignity.

The SWG spent many hours studying these events to develop Recommendations to eliminate these tragedies in the future. The study of events leading up to these tragedies offers the opportunity to further improve safety and save lives of men and women working in the railroad industry. The families and friends who experienced these events can be assured that the lessons learned will save other families from the sorrow experienced during their agonizing loss.

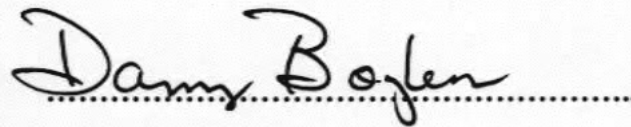
“The SWG believes the goal of Zero Fatalities can be achieved only after the Operating Recommendations are accepted and become a constant work practice.”

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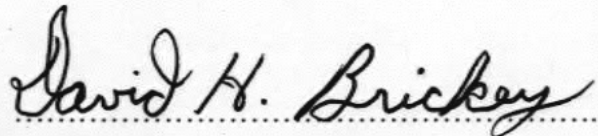
The SOFA Working Group

May 2004

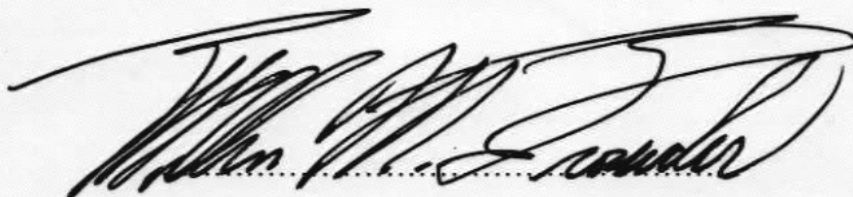
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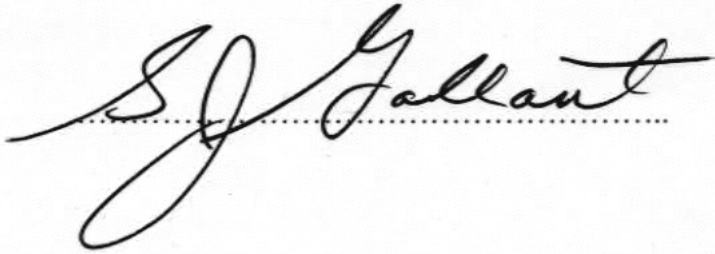
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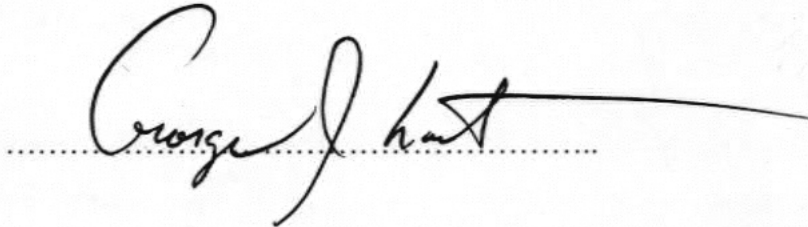
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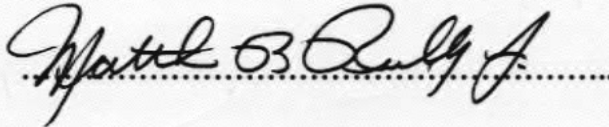
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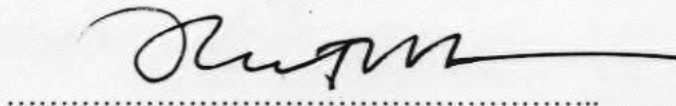
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The present SWG expresses its appreciation to past SWG members for committing their talents and energies towards the goal of Zero Switching Fatalities:

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Note: Brotherhood of Locomotive Engineers and Trainmen (BLET) was formerly the Brotherhood of Locomotive Engineers (BLE).

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EXECUTIVE SUMMARY

General

Since the release of the *SOFA Report: Findings and Recommendations of the SOFA Working Group* in October 1999, the SOFA Working Group (SWG) has undertaken activities directed toward the goal of Zero Switching Fatalities. SWG activities focus on:

- reviewing the 48 switching fatalities that occurred through December 2003, since the 76 fatalities upon which the *SOFA Report* was based;
- drawing the attention of those engaged in switching operations to the Five Operating Recommendations made in the *SOFA Report*;
- identifying ‘Special Switching Hazards’ such as close clearance, being struck by mainline trains, and shoving that resulted in switching fatalities that were not necessarily preventable by one or more Operating Recommendations;
- studying Severe Injuries, such as amputations, which cause harm to employees engaged in switching operations; and
- publicizing information about the number and types of switching fatalities and Severe Injuries.

Activities

This report describes SWG activities, provides updated information on the number and type of switching fatalities occurring since the release of the *SOFA Report*, and – importantly – discusses how fatalities occur and can be prevented. Below is a summary of SWG activities since October 1999.

- **Zero Switching Fatality Goal.** The SWG established a Zero Switching Fatality Goal with no tolerance for any other outcome. There were 6 switching fatalities in 2002, the lowest on record. SWG fatality records go back to 1975. The next lowest count was 7 in 1996. In 2003, there were 10 switching fatalities. In 2004 through June, there have been 4 fatalities.

Because switching fatalities continue to occur, the SWG recognizes additional safety efforts are needed, including those based on the Five Operating Recommendations, to achieve the Zero Switching Fatality Goal.

- **Ongoing Review of Switching Fatalities.** Since July 1, 1998, the date of the 76th and last switching fatality upon which the *SOFA Report* was based, 48 fatalities occurred to employees engaged in switching operations through December 31, 2003. The SWG reviewed each of these fatalities and entered available information into its database, the ‘SOFA Matrix,’ already containing descriptions of the 76 fatalities. Review of each additional switching fatality remains a SWG priority. Maintaining the SOFA Matrix provides the SWG with a searchable

database of current and past switching fatalities going back through January 1, 1992. Searches are undertaken to answer railroad-community queries, provide fatality count updates, and undertake analyses.

- **Ongoing Evaluation of the Five Operating Recommendations.** Forty-one of the 76 switching fatalities in the *SOFA Report* period, January 1, 1992 through July 1, 1998, involved one or more of the Five Operating Recommendations – 54 percent. Originally, when the *SOFA Report* was released, 37 switching fatalities formed the basis of one or more of the Operating Recommendations. Upon subsequent review of the 76 fatalities, the SWG determined that 4 more of the 76 fatalities also involved one or more Operating Recommendations.

When the *SOFA Report* was released in October 1999, an additional 10 fatalities occurred in the period July 2, 1998 through October 31, 1999. Six of these fatalities involved one or more Recommendations. Thus, from January 1, 1992 through October 31, 1999, 47 of the 86 switching fatalities involved Recommendations – 55 percent.

Since October 31, 1999 (the post-report period), the SWG reviewed 38 switching fatalities, 17 involving one or more Operating Recommendations – 45 percent. While the 54 vs. 45 percent reduction is worth noting, the focus should remain on the fact that fatalities occur and are preventable by the Five Operating Recommendations; and switching fatalities still occur at the rate of 10.3 per year.

- **Special Switching Hazards.** In addition to the Five Operating Recommendations, the SWG wants to make those engaged in switching operations aware of Special Switching Hazards. In its review of each of the 124 fatalities, the SWG identified a number of fatalities involving close clearances (10 fatalities), being struck by mainline trains (8 fatalities), and occurring during shove movements (61 fatalities). The number of fatalities involving close clearance and being struck by mainline trains would be greater if those classified both as a Special Switching Hazard and an Operating Recommendation were included in these fatality counts.
- **Preventing Switching Fatalities.** The SWG has classified the 124 switching fatalities, occurring from January 1992 through 2003, as either involving an Operating Recommendation, or a Special Switching Hazard. In reality, fatality events are complex sequences of events occurring amidst a variety of background conditions. Some of the fatalities involving Operating Recommendations also involve Special Switching Hazards. However, for prevention purposes, adherence to the Operating Recommendations and awareness of Special Switching Hazards will potentially prevent all switching fatalities.
- **Periodic Safety Alerts.** The SWG uses the SOFA Matrix, containing the history of 124 fatalities, to identify trends, commonalities, and Special Switching Hazards among fatality events. When such patterns occur, the SWG informs those engaged in switching operations. When the SWG recognized recently that 13 fatalities resulted from employees being struck by mainline trains, it sent out an alert. Employees on the ground were struck by mainline trains while performing 'roll by' inspections, inspecting equipment, or getting on and off their equipment. The fatality events were described in detail in the alert.

Similarly, the SWG issued an alert in December 2003 calling attention to the 15 switching fatalities occurring in the 24-day period, December 22 through January 14, for the eleven years, 1992 through 2002. Only three years – 1992, 1996, and 2002 – in this period were switching-fatality free. Twelve of the 15 employees (80 percent) had 20 or more years of service; and thirteen of the 15 employees (87 percent) were over 40 years old.

In the alert, the SWG stressed that while this period is extremely risky, switching fatalities can occur at any time to anyone engaged in switching operations.

- **Appendix to *SOFA Report*.** In August 2000, the SWG published an appendix to the *SOFA Report* entitled *Findings and Recommendations of the SOFA Working Group, Appendix – Volume II*. It contains SWG working papers, many in the form of figures and tables, used to analyze fatality events, search for commonalities, and develop the Five Operating Recommendations contained in the *SOFA Report*.

This report is available electronically at the Federal Railroad Administration (FRA) Office of Safety Web site: <http://www.fra.dot.gov/Content3.asp?P=102>.

- **Severe Injury Report.** In July 2001, the SWG published *Severe Injuries to Train and Engine Service Employees: Data Description and Injury Characteristics*. This report contains information developed from the review of 446 Severe Injuries occurring to employees from January 1, 1997 to March 31, 2000. ‘Severe Injuries’ are defined by the SWG as injuries (1) potentially life threatening; (2) having a high likelihood of permanent loss of function; (3) likely to result in significant work restrictions; and (4) caused by a high-energy impact to the human body. (The full definition of Severe Injuries is given in Section 5.) Since 1997, on average, 132.7 Severe Injuries have occurred each year.

The SWG reviewed Severe Injuries because it felt the causes were similar to those of fatalities. However, the information necessary to determine that relationship does not exist. Severe Injuries are not normally investigated by the FRA, while fatalities to employees on duty are required to be investigated.

The *Severe Injury Report* is available electronically at the FRA’s Office of Safety Web site: <http://www.fra.dot.gov/Content3.asp?P=102>.

- **Best Practices Guidelines for Implementing Operating Recommendations.** In March 2000, George A. Gavalla, FRA’s Associate Administrator for Safety, asked the SWG to develop guidelines — ‘best practices’ — for industry implementation of the Five Operating Recommendations. The developed guidelines, shown in Appendix A, emphasize education and a positive, judicious approach to implementation; and that the Recommendations should not be used as a basis for discipline.
- **SOFA Video.** The SWG developed a video describing results of the *SOFA Report* with emphasis on the Five Operating Recommendations, and the fatality cases upon which each of the Recommendations were based. The SOFA video addresses the needs of the employees at the ballast level for information explaining the Operating Recommendations.

- **Crew Resource Management (CRM).** The railroad industry took the lead in initiating a Task Force to implement an Additional Recommendation¹ made in the *SOFA Report*. The railroad industry Task Force created a generic program for train and engine employees. This CRM program provides a team-based framework through which to evaluate conditions, apply rules, and safely perform work tasks. Topics covered in the program include decision making, assertiveness, crew coordination, leadership, teamwork, situational awareness, and active practice and feedback.
- **Industry Leadership Conference Calls.** The SWG participates in periodic Leadership Conference Calls with representatives from the Association of American Railroads (AAR), the American Short Line and Regional Railroad Association (ASLRRA), the FRA, the Brotherhood of Locomotive Engineers and Trainmen (BLET)², and the United Transportation Union (UTU). These calls developed out of a Railroad Safety Advisory Committee (RSAC) declaration.

The original purpose of these Leadership Conference Calls was a discussion by each representative of issues specific to their organizations' implementation of the SOFA Operating Recommendations and to report measurable results. The calls now include general discussions of SOFA-related issues. There have been eight calls to date.

- **The Five Lifesavers.** The SWG developed shortened versions of the Five Operating Recommendations. 'The Five Lifesavers' serve as reminders to employees engaged in switching operations of the Operating Recommendations that will reduce their risk - and that of crew members. The Five Lifesavers are not meant as substitutes for the more comprehensive Recommendations that represent a series of safe actions that employees can take in reducing their risks in switching operations.

The Five Lifesavers

1. Secure equipment before action is taken.
2. Protect employees against moving equipment.
3. Discuss safety at the beginning of a job or when a project changes.
4. Communicate before action is taken.
5. Mentor less experienced employees to perform service safely.

It should be noted that the Five Lifesavers and the Operating Recommendations are for all employees engaged in switching operations – not just yard employees. Switching fatalities

¹ These recommendations for the most part do not involve switching operations directly (unexpected train movement being the exception) which the SWG believes, nonetheless, will help reduce risk in switching operations and facilitate the collection of fatality information.

² Note: Brotherhood of Locomotive Engineers and Trainmen (BLET) was formerly the Brotherhood of Locomotive Engineers (BLE).

occur at all locations — yards, mainlines, industries, and sidings — wherever switching occurs, there are risks to employees.

- **SOFA Educational Material.** The SWG developed educational safety material: hats, pens, wallet-size cards, magnetic strips that can be applied to a refrigerator (allowing family members to be aware of safety efforts), stickers, and switch-list covers. Much of this material displays the Five Lifesavers. The intent is that this material will serve as a reminder to work safely when engaged in switching operations.
- **Speaking Publicly About Switching Fatalities.** The SWG speaks to its respective member organizations, and other groups involved in railroad safety. These discussions include reviews of the Five Operating Recommendations, SWG activities, and updates of switching fatalities and Severe Injuries. As an example, on February 10, 2003, the SWG spoke at the *2003 Winter Meeting of the American Association of Railroad Superintendents* (AARS) in Chicago, Illinois.
- **Ballast Level Safety Information.** The SWG periodically provides the railroad industry with updated counts of switching fatalities, Severe Injuries, and amputations (a type of Severe Injuries). It is the intent of the SWG that this information reaches those actively engaged in switching operations – employees and managers at the ballast level. The updates also include descriptions of the sequence of events leading to specific types of fatalities. It is hoped that by drawing attention to past fatalities, future fatalities can be prevented.
- **Examining Experimental Safety Proposals and Devices.** The SWG has examined several proposals and experimental devices that were developed to enhance safety in switching operations. These devices included methods for detection of rail equipment, reflectorization, warning alarms, and physical characteristics identification training. The SWG encourages the investigation of technologies holding promise for safer switching operations.
- **SOFA Safety Web Site.** The SWG maintains a Web page on the FRA's Office of Safety Web site containing safety information and access to electronic copies of SOFA reports and a PowerPoint presentation: <http://www.fra.dot.gov/Content3.asp?P=102>.
- **Review of Additional Recommendations.** In the *SOFA Report* of October 1999, the SWG made Additional Recommendations. These Additional Recommendations (listed in section 1.6) are for the most part recommendations not involving switching operations directly (unexpected train movement being the exception) that the SWG believes, nonetheless, will help reduce risk in switching operations and facilitate the collection of fatality information. As a result of these Additional Recommendations, the FRA updated investigational protocols and adopted a more consistent procedure for collecting, and analyzing switching fatality investigation reports.

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OVERVIEW OF SWITCHING FATALITIES AND SEVERE INJURIES³

Twelve-Year History of Switching Fatalities

A twelve-year switching fatality history, January 1992 through December 2003, is shown below. In those twelve years, there have been, on average, 10.3 fatalities a year.⁴ Yearly fatality counts are essentially evenly distributed about this mean. The highest number of fatalities was 15 in 1993; the lowest, 6 in 2002. There were 10 switching fatalities in 2003. And there have been 4 fatalities through June 2004.

From 1991 back to 1983, switching fatalities were similar in number and distribution to those in the 1992-and-after period. Before 1983, fatalities were orders-of-magnitude higher. While SWG fatality counts go back to 1975, it is likely that the 6 fatalities in 2002 were the lowest ever since sizable switching activities developed in the mid-1800s.

Switching Fatalities January 1992 through June 2004

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	totals	avg.
JAN	2	0	4	1	0	2	1	2	1	2	0	0	1	16	1.2
FEB	0	0	0	2	0	1	1	1	0	0	0	3	0	8	0.6
MAR	1	1	0	2	1	0	0	0	1	1	1	0	1	9	0.7
APR	1	1	1	1	0	0	0	2	1	1	0	1	0	9	0.7
MAY	0	1	0	1	0	0	1	1	2	0	1	0	2	9	0.7
JUN	4	2	0	0	1	3	2	1	0	0	1	1	0	15	1.3
JUL	3	1	1	1	1	1	1	0	3	1	1	0		14	1.2
AUG	0	3	0	0	0	1	0	0	1	0	1	1		7	0.6
SEP	0	1	1	0	1	0	0	1	1	0	1	3		9	0.8
OCT	2	1	1	1	1	1	1	0	1	1	0	0		10	0.8
NOV	1	2	2	0	0	0	0	1	0	0	0	0		6	0.5
DEC	0	2	2	2	2	2	1	0	2	2	0	1		16	1.3
totals	14	15	12	11	7	11	8	9	13	8	6	10		128	10.4

³ The Severe Injury data was taken from the FRA Office of Safety's Web site in June 2004.

⁴ Going back to 1983, the average yearly number of switching fatalities is 10.4, virtually identical to the 10.3 average back to 1992. A standard deviation for the period back to 1992 is 2.8 fatalities; and, back to 1983 is 2.6 fatalities.

Seven-Year History of SOFA-defined Severe Injuries

The seven-year history of SOFA-defined Severe Injuries is shown below along with amputations, an acute form of Severe Injuries. These Severe Injuries include, in addition to amputations, fractures of bones other than fingers and toes. As such, Severe Injuries often result from high-energy impacts and can be career threatening. Severe Injuries can be defined back to 1997 with the revision of reporting form FRA F6180.55a. In 2003, there were 116 Severe Injuries, the lowest count in the seven-year period, 1997 through 2003; and 14.4 percent lower than the mean of 135.5 for the previous six years. There have been 24 Severe Injuries in January through April 2004.

Severe Injuries and Amputations 1992 through April 2004

	SOFA-defined Severe Injuries								Amputations							
	1997	1998	1999	2000	2001	2002	2003	2004	1997	1998	1999	2000	2001	2002	2003	2004
JAN	11	13	16	15	21	12	11	10	1	0	2	1	0	0	2	2
FEB	17	15	9	9	9	13	17	14	0	1	0	1	0	2	1	2
MAR	14	12	17	11	10	10	13	10	3	4	3	2	1	1	3	1
APR	8	10	6	10	12	6	9	12	1	2	0	1	2	0	1	1
MAY	6	12	8	8	12	14	10		1	2	3	0	2	2	2	
JUN	9	10	8	11	8	5	10		2	1	1	0	1	0	0	
JUL	9	14	10	8	10	7	6		1	5	1	0	4	0	1	
AUG	13	10	11	14	8	10	7		1	0	1	4	0	1	0	
SEP	10	11	15	10	20	12	5		2	4	3	2	5	4	0	
OCT	12	12	16	10	5	11	9		2	5	2	2	0	0	2	
NOV	12	9	12	11	13	14	10		2	2	2	2	3	0	1	
DEC	18	9	7	22	12	9	9		4	1	0	4	1	1	2	
totals	139	137	135	139	140	123	116		20	27	18	19	19	11	15	